BULLETIN

OF THE INSTITUTE OF METALS

VOLUME 1 AUGUST 1953 PART 24

WITH THEIR HUMBLE DUTY, THE COUNCIL, MEMBERS, AND STAFF OF THE INSTITUTE OF METALS OFFER THEIR CONGRATULATIONS TO HER MAJESTY THE QUEEN ON HER CORONATION, AND WISH HER A LONG, HAPPY, AND PEACEFUL REIGN

INSTITUTE NEWS

Annual Autumn Meeting, Southport, Lancs., Monday–Friday, 21–25 September 1953

As previously announced, the 1953 Autumn Meeting will be held at Southport, Lancs., from Monday to Friday, 21–25 September, by invitation of the Councils of the Manchester Metallurgical Society and the Liverpool Metallurgical Society.

RECEPTION COMMITTEE

The arrangements for the meeting have been made with the assistance and advice of a Reception Committee constituted as follows:

Lieut.-Commander G. K. RYLANDS, *Chairman* (Rylands Brothers, Ltd., Warrington).
Dr. W. E. ALKINS (Thomas Bolton and Sons, Ltd., Stoke-on-Trent).
Mr. H. ALLISON (Metropolitan-Vickers Electrical Co., Ltd., Manchester; President, Manchester Metallurgical Society, 1952–53).
Dr. S. F. BARCLAY (Mather and Platt, Ltd., Manchester).
Mr. E. BOWYER (British Insulated Callender's Cables, Ltd., Prescot).
Mr. C. F. BRERETON (Richard Johnson and Nephew, Ltd., Manchester).
Mr. R. S. BROWN (Rylands Brothers, Ltd., Warrington; President, Liverpool Metallurgical Society, 1952–53).
Mr. G. T. CALLIS (Manganese Bronze and Brass Co., Ltd., Birkenhead).
Mr. B. G. CHURCHER (Metropolitan-Vickers Electrical Co., Ltd., Manchester).
Mr. C. F. DAVEY (Thomas Bolton and Sons, Ltd., Widnes).
Sir Roy H. DOBSON (A. V. Roe and Co., Ltd., Middleton).
Mr. I. W. F. FAIRHOLME (Richard Johnson and Nephew, Ltd., Manchester).
Mr. W. L. GOVIER (Imperial Chemical Industries, Ltd., Metals Division, Kirkby).
Capt. A. C. JESSUP (Magnesium Elektron, Ltd., Clifton Junction).
Dr. W. L. KENT (The British Aluminium Co., Ltd., Warrington).
Mr. J. S. KERR (The Lancashire Steel Corporation, Ltd., Irlam).
Mr. H. J. MILLER (President, Liverpool Metallurgical Society).
Professor E. C. ROLLASON (University of Liverpool).
Mr. L. ROTHERHAM (Ministry of Supply, Division of Atomic Energy (Production), Risley).
Mr. F. R. SMITH (The English Electric Co., Ltd., and D. Napier and Son, Ltd., Liverpool).
Professor F. C. THOMPSON (University of Manchester).
Mr. W. T. T. WILCOX (The Shell Petroleum Co., Ltd.).
Mr. W. B. WRAGGE (President, Manchester Metallurgical Society).
Mr. S. V. RADCLIFFE, *Honorary Secretary* (Rylands Brothers, Ltd., Warrington).

For the convenience of members, hotel accommodation in Southport has been reserved at the Prince of Wales Hotel (which will be the Institute's headquarters hotel) and the Brunswick Hotel. It is particularly requested that accommodation at these two hotels shall be booked through the Institute, which has obtained preferential terms. Inexpensive accommodation for students has also been reserved at various private hotels, boarding-houses, apartments, &c.

It is hoped that there will be a large attendance of members and guests. Those who intend to be present (including those from South Lancashire) are requested to advise the Secretary as early as possible, stating the probable number of guests who will be accompanying them. This information is of much administrative value, if received well in advance of the completed meeting reply forms.

Members of overseas metallurgical societies will be welcome to attend the meeting and to participate on the same terms as members of the Institute.

Meeting Registration Fee

A registration fee of 20*s*. for each member or male guest and 10*s*. for each lady guest, will be charged to cover the general costs of administration, badges, tickets, &c.

PROGRAMME

The programme of the meeting is detailed below; a copy of the Meeting Reply Form is enclosed with all copies of this issue sent to members resident outside the British Isles. All British members will receive a separately printed copy of the programme, with reply form.

Monday, 21 September

Location: Prince of Wales Hotel, Lord Street.

2.30 to 8.0 p.m. The Secretary's office will be open for the registration of members and guests.

Location: Town Hall, Lord Street.

6.30 p.m. Twenty-Fourth Annual Autumn Lecture, by Dr. MAURICE COOK, F.I.M.

(Tickets are not required; visitors will be welcome.)

Location: Prince of Wales Hotel, Lord Street.

8.15 for 8.30 p.m. Council Dinner to the Autumn Lecturer.

Tuesday, 22 September

Location: Town Hall, Lord Street.

9.0 a.m. to 12.45 p.m. The Secretary's office will be open for the registration of members and guests.

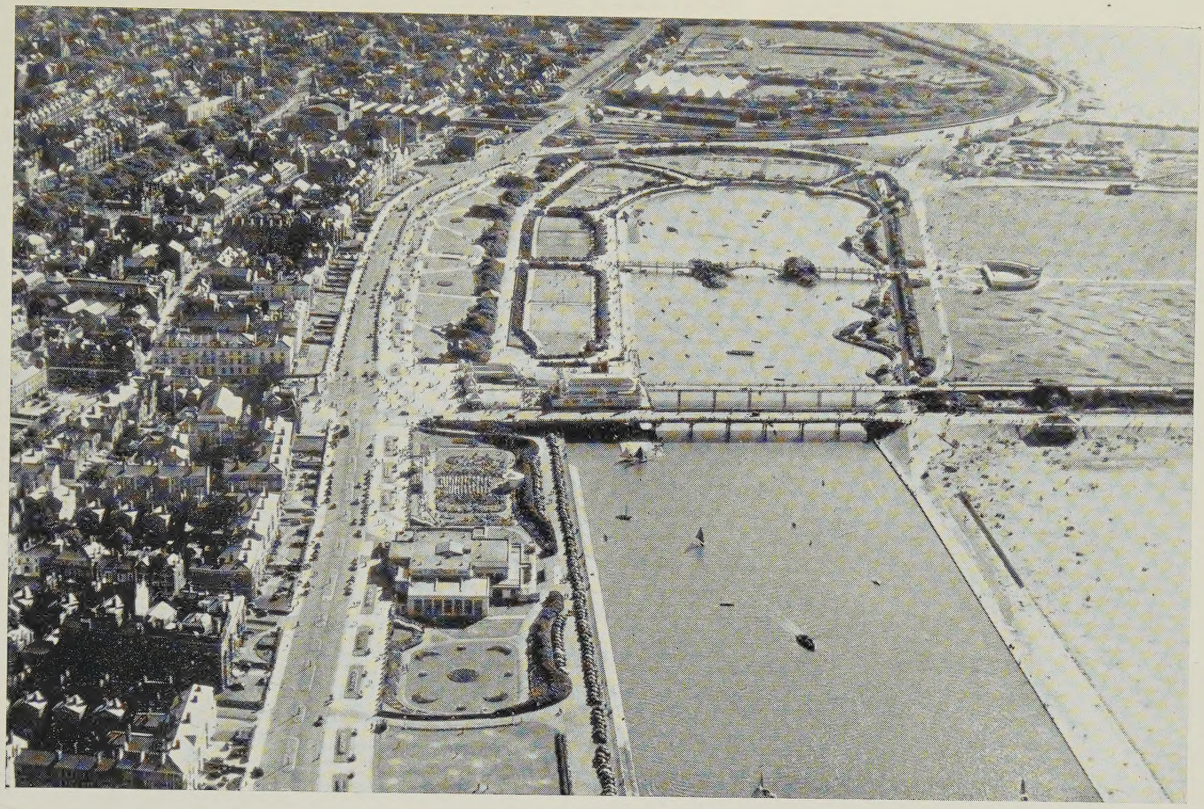
9.30 a.m. Welcome by His Worship the Mayor of Southport (Councillor William Tattersall, J.P.).

Two Concurrent Scientific Sessions:

SESSION "A"

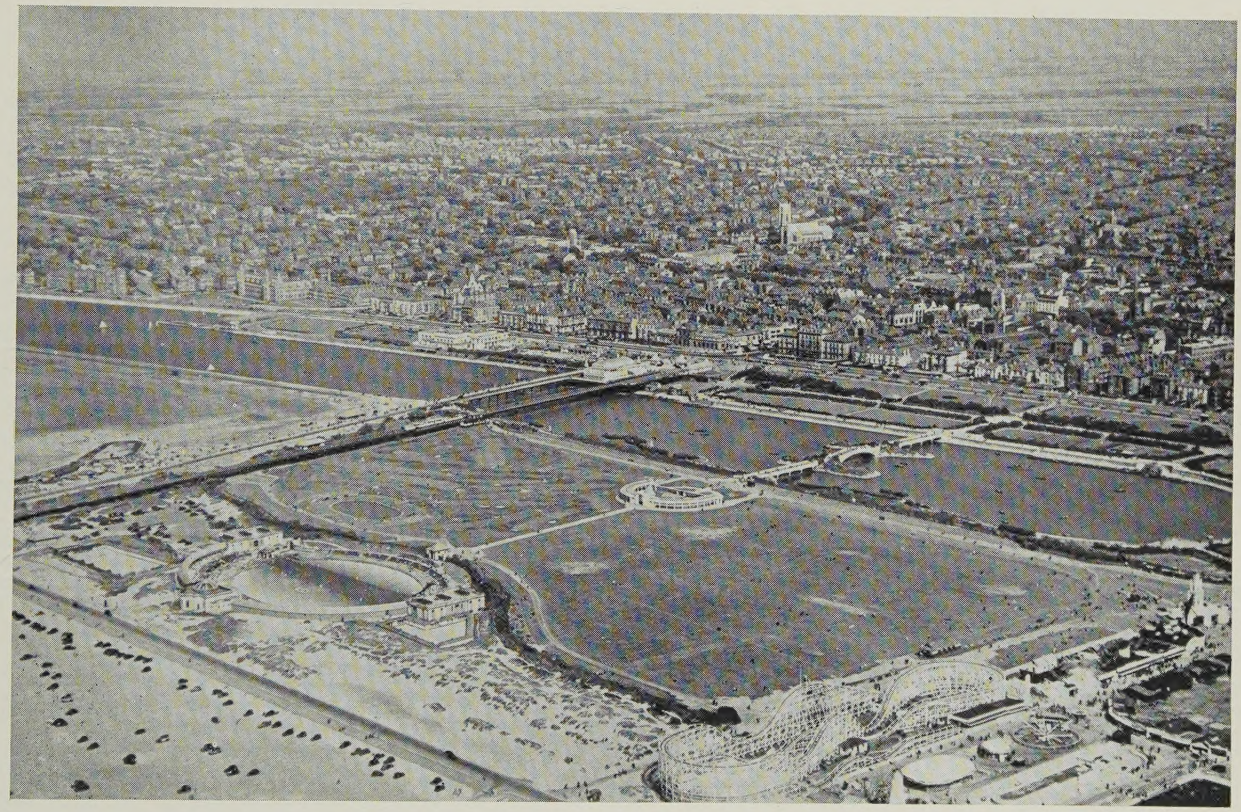
9.45 a.m. *Theme: Stretcher-Strain Markings.* A discussion, based on the following papers published in the *Journal* or *Bulletin*:

R. CHADWICK and W. H. L. HOOPER: "Some Observations on the Occurrence of Stretcher-Strain Markings in an Aluminium–Magnesium Alloy" (No. 1320; Sept. 1951).
W. H. L. HOOPER: "The Influence of Composition on the Incidence of Strain Markings in Aluminium Alloys" (No. 1477; July 1953).
N. KRUPNIK and H. FORD: "The Stepped Stress/Strain Curve of Some Aluminium Alloys" (No. 1480; Aug. 1953).
N. H. POLAKOWSKI: "Discontinuous Flow and Strain-Ageing in a 6% Tin Phosphor-Bronze" (No. 1481; Aug. 1953).
V. A. PHILLIPS, A. J. SWAIN, and R. EBORALL: "Yield-Point Phenomena and Stretcher-Strain Markings in Aluminium–Magnesium Alloys" (No. 1482; Aug. 1953).
W. H. L. HOOPER and J. HOLDEN: "Some Methods of Measuring Surface Topography as



Marine Lake and Parks, Southport.

Photo: Aero Pictorial, Ltd.



Promenade, Marine Lake, and Parks, Southport.

Photo: Aero Pictorial, Ltd.

Applied to Stretcher-Strain Markings on Metal Sheet" (*Bulletin*, Feb. 1953, pp. 161–165, and (summary) *Journal*, No. 1483; Aug., 1953).

V. A. PHILLIPS: "Effect of Composition and Heat-Treatment on Yield-Point Phenomena in Aluminium Alloys" (No. 1484; Aug. 1953).

11.30 a.m. *Theme: Priming Paints for Light Alloys.* A discussion, based on the following paper published in the *Journal*:

J. G. RIGG and E. W. SKERREY: "Priming Paints for Light Alloys" (No. 1468; June 1953).

12.30 p.m. Adjournment.

SESSION "B"

9.45 a.m. *Theme: Oxidation and Sulphidation of Copper.* A discussion, based on the following papers published in the *Journal*:

R. F. TYLECOTE: "The Oxidation of Copper in the Temperature Range 200°–800° C." (No. 1486; Aug. 1953).

T. P. HOAR and A. J. P. TUCKER: "Growth of Sulphide Films on Copper" (No. 1485; Aug. 1953).

11.15 a.m. *Theme: Diffusion and the Kirkendall Effect.* A discussion, based on the following papers published in the *Journal*:

H. BÜCKLE and J. BLIN: "Micrographic Aspects of the Diffusion of Zinc and Aluminium in Copper" (No. 1358; March 1952).

E. LARDNER: "The Formation of Intracrystalline Voids in Solution-Treated Magnesium–Aluminium Alloys" (No. 1461; May 1953).

12.30 p.m. Adjournment.

Afternoon. Visits, by invitation, for ticket holders only, who have *registered* for the meeting. Transport, kindly provided by the Reception Committee, will leave from the front of the Town Hall, Southport, *promptly* at the times stated. It is particularly requested that, out of courtesy to the hosts, members and delegates will not fail to take part in the visits for which they are issued with tickets.

(a) *Members and Male Guests*

1.45 p.m. Automatic Telephone and Electric Co., Ltd., Strowger Works, Edge Lane, Liverpool 7.

1.45 p.m. British Insulated Callender's Cables, Ltd., and British Copper Refiners, Ltd., Prescot.

1.45 p.m. The English Electric Co., Ltd., East Lancashire Road, Liverpool 10, and D. Napier and Son, Ltd., East Lancashire Road Works, Liverpool 10.

1.45 p.m. The Manganese Bronze and Brass Co., Ltd., Dock Road, Birkenhead.

1.45 p.m. Pilkington Brothers, Ltd., St. Helens (Glass manufacturers), and Fibreglass, Ltd., Ravenhead, St. Helens.

(b) *Ladies' Visits* (Members may also take part, if desired)

1.45 p.m. Dunlop Rubber Co., Ltd., Speke, Liverpool 19.

1.45 p.m. Horrockses Crewdson Spinning and Manufacturing Co., Ltd., Preston (Textile factory).

1.45 p.m. Speke Hall, Liverpool, and Liverpool Cathedral.

Evening.

8.0 p.m. *Civic Reception*, with dancing, at the Town Hall, for members and their guests *registered* for the meeting, by invitation of His Worship the Mayor of Southport (Councillor William Tattersall, J.P.). (Evening dress—tails or dinner jacket—or uniform.)

Wednesday, 23 September

All-day visits, by invitation, for ticket holders only who have *registered* for the meeting, to works, laboratories, and other places of interest located at a considerable distance from Southport. Transport, kindly provided by the Reception Committee, will leave the Town Hall, Southport, *promptly* at the times stated. It is particularly requested that, out of courtesy to the hosts, members and delegates will not fail to take part in the visits for which they receive tickets.

(a) *Members and Male Guests*

Visit No. 1

Morn. The Lancashire Steel Corporation, Ltd., Irlam (Steelmaking).
Lunch at Irlam, by invitation of The Lancashire Steel Corporation, Ltd.

Aft. Rylands Brothers, Ltd., Warrington (Wire-drawing and nail making).

Visit No. 2

Morn. Ministry of Supply, Division of Atomic Energy (Production), Metallurgical Laboratories, Culcheth, Warrington.
Lunch at Warrington, by invitation of The British Aluminium Co., Ltd.

Aft. The British Aluminium Co., Ltd., Bank Quay Works, Warrington.

Visit No. 3

All day. John Summers and Sons, Ltd., Hawarden Bridge Steelworks, Shotton, near Chester (Steelmaking and rolling and galvanizing of sheet).
Lunch, by invitation of the Company.

Visit No. 4

Morn. Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester 17.
Lunch at Trafford Park, by invitation of Metropolitan-Vickers Electrical Co., Ltd.

Aft. Magnesium Elektron, Ltd., Clifton Junction, near Manchester.

Visit No. 5

Morn. Richard Johnson and Nephew, Ltd., Forge Lane, Manchester, 11 (Wire manufacturers).
Lunch at Leyland, by invitation of Leyland Motors, Ltd.

Aft. Leyland Motors, Ltd., Leyland.

Visit No. 6

All day. Thornton Research Centre, The Shell Petroleum Co., Ltd., Thornton-le-Moors, Cheshire, and brief tour of the adjacent Stanlow Refinery of The Shell Refining and Marketing Co., Ltd.
Lunch and tea by invitation of The Shell Petroleum Co., Ltd.

(b) *Ladies' Visits* (Members may also take part, if desired)

Visit No. 7

Morn. Visits in Chester (it will be early closing day in Chester).
Lunch at Blossoms Hotel, Chester.

Aft. Lever Brothers, Port Sunlight, Ltd., Port Sunlight, Cheshire: tour of soap works and the Lady Lever Art Gallery.
Tea at Port Sunlight by invitation of the Company.

8.0 p.m. for 8.15 p.m. *Banquet* for members and their guests who have *registered* for the meeting, by invitation of the Reception Committee, at the Prince of Wales Hotel, Lord Street, Southport. (Dress: evening dress—tails or dinner jacket—or uniform, with decorations.)

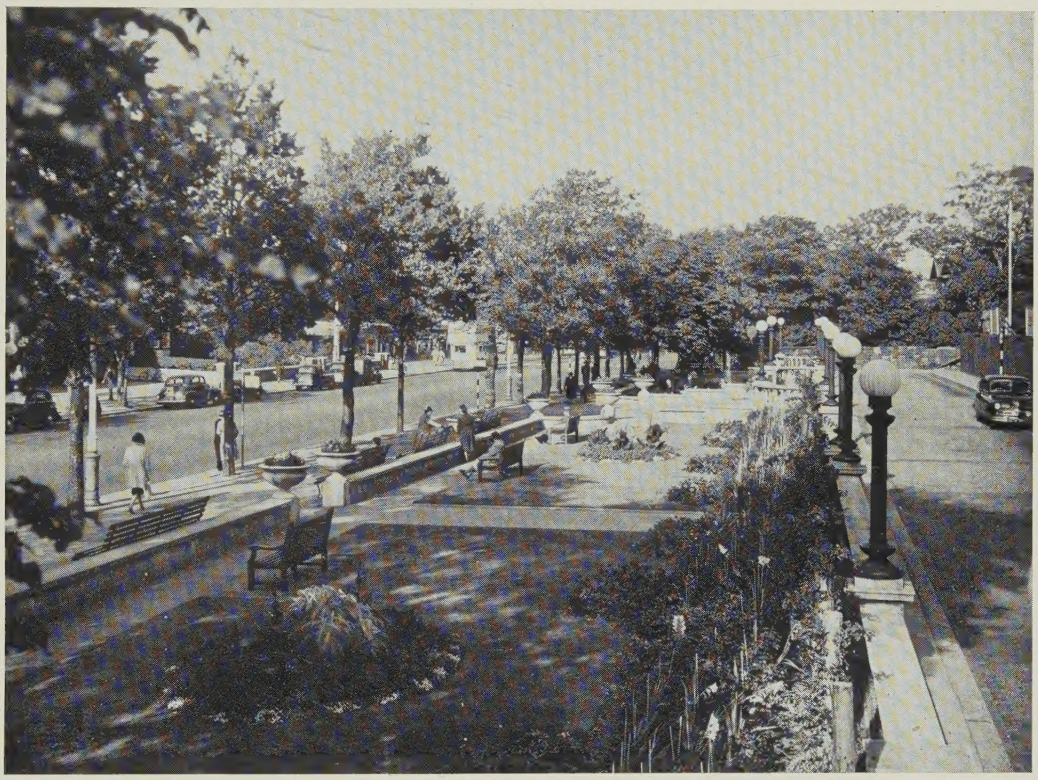


Photo: Valentine, Dundee.

Lord Street, Southport.

Thursday 24 September

Location: Town Hall, Lord Street, Southport.

9.0 a.m. to 12.45 p.m. The Secretary's office will be open.
Two concurrent Scientific Sessions:

SESSION "A"

9.45 a.m. *Informal Discussion on "Damping Capacity"*, arranged by the Metal Physics Committee.

12.15 p.m. Adjournment.

12.20 p.m. Votes of Thanks: Conclusion of the meeting.

SESSION "B"

9.45 a.m. *Theme: Structure of Nickel Alloys.* A discussion based on the following papers:

A. Taylor and R. W. Floyd: "The Constitution of Nickel-Rich Alloys of the Nickel–Titanium–Aluminium System" (No. 1411; Sept. 1952).

A. Taylor and K. G. Hinton: "A Study of Order-Disorder and Precipitation Phenomena in Nickel–Chromium Alloys" (No. 1429; Dec. 1952).

A. Taylor and R. W. Floyd: "The Constitution of Nickel-Rich Alloys of the Nickel–Chromium–Aluminium System" (No. 1464; May 1953).

11.0 a.m. *Theme: Properties of Chromium and its Alloys.* A discussion based on the following papers:

A. H. Sully, E. A. Brandes, and A. G. Provan: "The Properties of Cast Chromium Alloys at Elevated Temperatures. I.—The Melting and Casting of Chromium-Rich Alloys". II.—Some Properties of Certain Binary Chromium-Rich Alloys", by A. H. Sully and E. A. Brandes. III.—"The Creep Properties of Ternary and More Complex Chromium-Base Alloys", by A. H. Sully and E. A. Brandes (No. 1478; Aug. 1953).

A. H. Sully, E. A. Brandes and K. W. Mitchell: "The Effect of Temperature and Purity on the Ductility and Other Properties of Chromium" (No. 1479; Aug. 1953).

12.15 p.m. Adjournment. Meeting will resume in the main meeting hall at 12.20 p.m. for Votes of Thanks and concluding business.

Afternoon. Visits, by invitation, for ticket holders only who have *registered* for the meeting. Transport kindly provided by the Reception Committee, will leave the Town Hall, Southport, *promptly* at the times stated. It is particularly requested that, out of courtesy to the hosts, members and delegates will not fail to take part in the visits for which they are issued with tickets.

(a) *Members and Male Guests*

1.45 p.m. British Insulated Callender's Cables, Ltd., and British Copper Refiners, Ltd., Prescot.

1.45 p.m. Manganese Bronze and Brass Co., Ltd., Dock Road, Birkenhead.

1.45 p.m. Williams Harvey and Co., Ltd., Mellanear Works, Bootle, Liverpool 20 (Tin smelters). (*Note:* Competitors can be received only on the understanding that their acceptance of the invitation implies an invitation to members of Williams Harvey and Co., Ltd., to visit the guest's own company's works.)

(b) *Ladies' Visits* (Members may also take part, if desired)

1.45 p.m. Knowsley Hall, Prescot (Seat of the Earl of Derby).

1.45 p.m. Arthur H. Lee and Sons, Ltd., Stanley Road, Birkenhead (Tapestry manufacturers).

1.45 p.m. W. and R. Jacob and Co. (Liverpool), Ltd., Aintree Biscuit Factory, Liverpool 9.

Friday, 25 September

9.0 a.m. All-day Tour of North Wales—mountains and coast. *Route :* Mersey Tunnel, Queensferry, Mold, Ruthin, Pentre Voelas, Bettws-y-Coed, along the Conway Valley to Colwyn Bay, returning via St. Asaph, Holywell, Queensferry, and Mersey Tunnel. Returning to Southport by approx. 7.30 p.m. Coaches will leave the Town Hall, Southport, *promptly* at the time stated. Lunch will be taken at Bettws-y-Coed and tea at Colwyn Bay.

Presentation of the Institute's Platinum Medal to Dr. R. W. Diamond

The Institute of Metals Platinum Medal for 1951 was awarded to Dr. Randolphe William DIAMOND, Vice-President and General Manager of The Consolidated Mining and Smelting Company of Canada, Ltd., Trail, B.C., in recognition of his outstanding services to the non-ferrous metal industries in connection with researches on differential flotation as applied to the complex Sullivan ore, and as manager of the largest combined lead and zinc producer in the world. Unfortunately, Dr. Diamond has not found it possible to visit England to receive the medal.

At a dinner party at the Ritz Carlton Hotel, Montreal, on Monday, 1 April, in the presence of a distinguished gathering of Canadian metallurgists and engineers, the medal was presented to Dr. Diamond, on behalf of the Council, by Professor G. Letendre, an Honorary Corresponding Member to the Council for Canada.

The guests at the ceremony included Mr. R. E. Stavert, President, The Consolidated Mining and Smelting Company of Canada, Ltd.; Mr. Jules R. Timmins, President, Hollinger Consolidated Gold Mines, Ltd., Labrador Mining and Exploration Co., Ltd., and other companies; Dr. A. O. Dufresne, Deputy Minister of Mines, Province of Quebec; Dr. J. B. Stirling, President, Engineering Institute of Canada; Mr. C. Gerow, Secretary-Treasurer, Engineering Institute of Canada; Mr. R. F. Shaw, President, the Corporation of Professional Engineers of the Province of Quebec; Mr. H. J. Roast, Consultant, The Canadian Bronze Co., Ltd.; Mr. W. H. Durrell, General Manager, Labrador Mining Exploration Co. and the Iron Ore Company of Canada, Ltd.; Mr. R. Hendricks, Assistant to the President, The Consolidated Mining and Smelting Company of Canada, Ltd.; and Messrs. Kirkpatrick and Wolfkill, high officials of the same company.

Dr. R. W. Diamond (*left*) and Professor G. Letendre.

The Institute's Membership

The Institute's membership on 1 July was 4127, a net increase of 240 over the total on 1 July 1952. The latest elections are given below.

As the Institute's new financial year began on 1 July, this is a particularly good time at which to apply for membership. Particulars of membership and application forms will be sent to any persons interested to receive them.

Election of Members

The following 26 Ordinary Members, 1 Junior Member, and 1 Student Member were elected on 12 June 1953 :

As Ordinary Members

ASHLEY, Tom Eric Ludlow, General Works Manager (Banbury), Northern Aluminium Co., Ltd., Banbury, Oxon.

BALDWIN, *Professor* William Marsh, Jr., Ch.E., M.Sc., Ph.D., Research Professor, Case Institute of Technology, Cleveland 6, O., U.S.A.

BOSSERT, Theodore William, S.B., Assistant Chief Metallurgist, Aluminum Company of America, 1501 Alcoa Building, Pittsburgh 19, Pa., U.S.A.

BURPEE, Donald McKibbin, M.A., Plant Manager, Handy and Harman of Canada, Ltd., 141 John Street, Toronto 2B, Ont., Canada.

COLTON, Robert A., B.S., Sales Manager, Federated Metals Division, American Smelting and Refining Company, 1160 State Street, Barber, N.J., U.S.A.

DUFFNER, Rupert L., B.S., Metallurgist, Hudson Wire Company, 62 Water Street, Ossining, N.Y., U.S.A.

EDWARDS, Harold, F.R.I.C., A.M.I.Chem.E., F.I.M., Plant Manager, Cold Strip Mill, John Summers and Sons, Ltd., Hawarden Bridge Steelworks, Shotton, Chester.

HATHERLY, Max, Metallurgist, Defence Research Laboratories, Box 60, Alexandria, N.S.W., Australia.

VAN DER HORST, Johannes Martinus Arnold, Managing Director, van der Horst Corporation of America, 1645 E. State Street, Olean, N.Y., U.S.A.

KEGLEY, Tracy Mitchell, Jr., M.S., Metallurgical Research, Oak Ridge National Laboratory, P.O. Box P., Oak Ridge, Tenn., U.S.A.

VAN KEMPEN, Charles, Managing Director, Johan Vis and Co., N.V., Corn. Douwesweg 1, Amsterdam, Netherlands.

KETCHUM, J. Allan, B.Ch.E., Senior Metallurgist, Kaiser Aluminum and Chemical Corporation, Newark, O., U.S.A.

KNUTH-WINTERFELDT, *Professor* Eggert, Dr. techn., Professor and Chief of the Department of Metallurgy, Danmarks Tekniske Højskole, Østervoldgade 10, Copenhagen, K, Denmark.

KORCZYNSKY, Michael, Dipl.-Ing., Research Metallurgist, Metals Research Laboratories, 4625 Royal Avenue, Niagara Falls, N.Y., U.S.A.

LONG, Carleton C., B.S., M.A., Ph.D., P.E., Director, Plant Research Department, St. Joseph Lead Company, Box 97, Monaca 7, Pa., U.S.A.

OLIPHANT, William Douglas, B.Sc., M.I.E.E., F.Inst.P., F.R.A.S., F.R.S.E., A.I.Mech.E., Research Physicist and Engineer, Ferranti, Ltd., Ferry Road, Edinburgh 5.

OLMER, Philippe, Dr.-ès-Sc., Directeur, Ecole Nationale Supérieure de la Métallurgie et de l'Industrie des Mines, Université de Nancy, 15 Place Carnot, Nancy, France.

PILLING, John Robert Makin, Managing Director, J. and J. Makin (Metals), Ltd., 16 Deansgate, Manchester 3.

POWELL, Eric, Overseas Representative, Imperial Chemical Industries, Ltd., Metals Division, 49 Kali Besar Barat, Jakarta, Indonesia.

PREISLER, Joseph John, B.Ch.E., Senior Materials Engineer, in charge Metallic Materials and Metallurgical Processes, Sperry Gyroscope Company, Division of Sperry Corporation, Great Neck, N.Y., U.S.A.

SALKOVITZ, Edward Isaac, M.S., D.Sc., Physicist, Metallurgy Division, Naval Research Laboratory, Washington 25, D.C., U.S.A.

SCHINDLER, Albert Isadore, M.S., D.Sc., Physicist, Metallurgy Division, U.S. Naval Research Laboratory, Washington 25, D.C., U.S.A.

WALLWORK, Robert, District Engineer, The Metallizing Equipment Co., Ltd., Chobham, near Woking, Surrey.

WEERTMAN, Johannes, D.Sc., Physicist, U.S. Naval Research Laboratory, Metallurgy Division, Washington 25, D.C., U.S.A.

WULFF, *Professor* John, E.M., D.Sc., Professor of Metallurgy, Massachusetts Institute of Technology, Cambridge 39, Mass., U.S.A.

YUM, Yung Ha, B.Sc. (Eng.), Assistant Professor, Engineering College, Seoul National University, Korea; temporarily United Nations Scholar at the Department of Metallurgy, Imperial College of Science and Technology, London, S.W.7.

As Junior Member

ALBERT, Paul André, B.S., Research Assistant, Research Division, New York University, New York 53, N.Y., U.S.A.

As Student Member

WOJTYCZKA, Anthony, Student of Metallurgy, Battersea Polytechnic, London, S.W.11

The following 15 Ordinary Members, 3 Junior Members, and 13 Student Members were elected on 30 June 1953:

ABLETT, George Karl, Chief Inspector and Works Metallurgist, Faulkners, Ltd., Colnbrook, Bucks.

BALL, Herbert A., B.S., Quality Control Superintendent, Western Brass Mills, Division of Olin Industries, Inc., Metals Division, East Alton, Ill., U.S.A.

DIANA, Frank B., Chem. Eng., Vice-President and General Manager, Z. Wagman and Son, Ltd., 190 Edwin Avenue, Toronto 9, Ont., Canada.

DUNKERLEY, Fred. J., D.Sc., Associate Professor of Metallurgy, Towne Science School, University of Pennsylvania, Philadelphia, Pa., U.S.A.

GILES, Wilfred Norman, Chief Designer, Faulkners, Ltd., Colnbrook, Bucks.

GONTZ, Robert Myles, B.S., Plant Metallurgist, Bohn Aluminum and Brass Corporation, 2619 Clay Avenue, Detroit 11, Mich., U.S.A.

GREEN, Edwin F., M.S., Chief Metallurgist, Axelson Manufacturing Company, Division of Pressed Steel Car Company, Box 15335 Vernon Station, Los Angeles 58, Calif., U.S.A.

LIPPERT, Thomas W., M.S., Manager of Sales and Technical Service, Titanium Metals Corporation of America, 60 East 42nd Street, New York 17, N.Y., U.S.A.

MACHLIN, Eugene Solomon, B.Mech.E., M.S., Sc.D., Assistant Professor of Metallurgy, School of Mines, Columbia University, New York, N.Y., U.S.A.

MAZZA, *Professor* Luigi, Direttore, Istituto di Chimica Generale, Università di Genova, Viale Benedetto XV, 3, Genova, Italy.

MIRCHANDANI, *Brigadier* T.T., M.Sc.Tech., A.M.I.Mech.E., Ordnance Consulting Officer, Staff of the High Commissioner for India, Military Department, 76 South Audley Street, London, W.1.

MOORADIAN, Victor George, Sc.D., Chief Metallurgist, The H. A. Wilson Company, U.S. Route 22, Union, N.J., U.S.A.

MORRIS, (Miss) Dorothy Evelyn, Sales Manager, London Works (Barlows), Ltd., Oldbury, Birmingham.

SUTTON, Henry, Works Manager, London Works (Barlows), Ltd., Oldbury, Birmingham.

ZMESKAL, *Professor* Otto, Sc.D., Director and Professor of Metallurgical Engineering, Illinois Institute of Technology, 3300 Federal Street, Chicago 16, Ill., U.S.A.

As Junior Members

FOUNTAIN, Richard W., M.S., Ph.D., Research Metallurgist, Union Carbide and Carbon Research Laboratories, Inc., P.O. Box 580, Niagara Falls, N.Y., U.S.A.

SHYNE, John C., M.S., Research Engineer, Metallurgical Department, Scientific Laboratory, Ford Motor Company, P.O. Box 2053, M.B. Station, Dearborn, Mich., U.S.A.

WILLIS, Peter Birkett Ashley, M.Sc., A.I.M., Research Metallurgist (Ministry of Supply), Department of Metallurgy and Fuel Technology, University College, Cardiff.

As Student Members

CRANE, Frederick Albert Andrew, Student of Metallurgy, Royal School of Mines, London, S.W.7.

EASTERBROOK, Eric John, Student of Metallurgy, Royal School of Mines, London, S.W.7.

KIDDLE, Peter James, Student of Metallurgy, Royal School of Mines, London, S.W.7.

MERIFIELD, David Kingsley, Student of Metallurgy, Royal School of Mines, London, S.W.7.

MEYER, Harry W., Student of Metallurgy, Royal School of Mines, London, S.W.7.

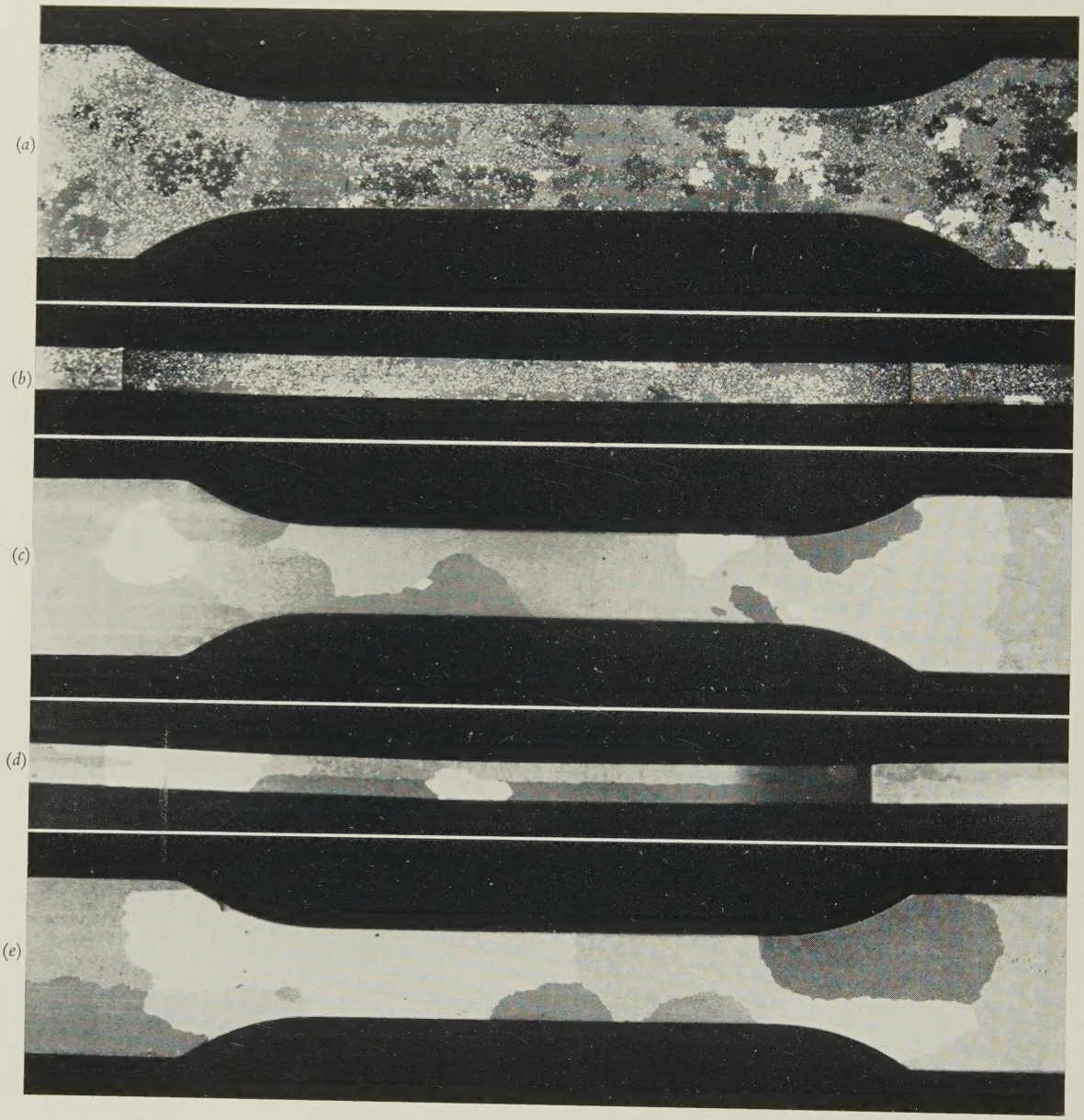


FIG. 1.—Test-Pieces Stamped from Super-Purity Aluminium Sheet. (See letter on opposite page.)

(*a*) and (*b*) After annealing at 500° C. for 6 hr.
(*c*)–(*e*) Annealed specimens after 1·7% elongation, and heating from 390° to 610° C., the temperature being raised by 40° C./day.

FISK, Bernard Godfrey, Student of Metallurgy, Royal School of Mines, London, S.W.7.

HEDGECOCK, Peter David, Student of Metallurgy, Royal School of Mines, London, S.W.7

HUIE, Alvin Leonard, Student, University of California, 2135 Ninth Street, Berkeley 2, Calif., U.S.A.

JONES, Geoffrey Peter, Student of Metallurgy, Royal School of Mines, London, S.W.7.

PEARCE, Gordon Leslie Randall, Student of Metallurgy, Royal School of Mines, London, S.W.7.

PRICE, Peter Everett, S.B., Research Assistant, Massachusetts Institute of Technology, Cambridge 39, Mass., U.S.A.

VERNON, Peter Norman, Student of Metallurgy, Royal School of Mines, London, S.W.7.

WRIGHT, Frank, Student of Metallurgy, Royal School of Mines, London, S.W.7.

Metallurgical Abstracts

In this issue of *Metallurgical Abstracts*, the last of Volume 20, an attempt has been made to include as many abstracts as possible from journals—mostly foreign—which for various reasons have fallen into arrears. Every effort will be made in the new volume to publish abstracts with the minimum delay.

LETTER TO THE EDITOR

The Growth of Large Crystals in Super-Purity Aluminium

For certain experiments, single crystals of super-purity aluminium were required. To prepare these, test-pieces were stamped from super-purity sheet supplied by The British Aluminium Co., Ltd., and then treated as follows: The test-pieces were given a primary anneal at 500° C. for 6 hr. Fig. 1 (*a*) and (*b*) show the crystal structure of the bars after this anneal. After cooling, the specimens were given a 1·7% permanent elongation and then placed in an annealing furnace at 390° C. The furnace temperature was raised by 40° C./day to 610° C. and then kept at this temperature for 2 days. All the specimens were supported at both ends by silica rods and so adjusted as to be, as nearly as possible, midway between roof and floor of the furnace.

The treated specimens in all cases grew not into single crystals but into a number of large crystals (Fig. 1 (*c*) to (*e*)), the crystals on one face of the specimen being separated from those on the opposite face by a boundary extending along the length of each specimen.

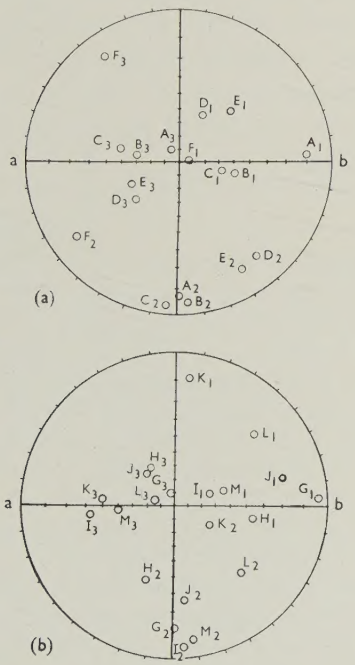


FIG. 2.

FIG. 3.

A preliminary investigation by reflected light and, to a greater accuracy, by electron-diffraction Kikuchi-line patterns showed that several adjacent pairs of crystals bore a twinned relationship (to within 10°) on the (112) planes. However, further investigation showed that these were exceptions, the majority being oriented so that (110) planes were normal to, or very nearly normal to, the direction of strain, i.e. the ⟨110⟩ direction, which is the slip direction in aluminium.

Determination of the crystals' orientations was carried out by the normal reflected-light method on etched surfaces of the specimens, and the poles of cube-face facets in relation to the main face of one of the bars, are shown in a stereographic projection (Fig. 2 (*a*) and (*b*)). Fig. 3 is a trace of crystal boundaries in the aluminium test-piece from which stereograms shown here were obtained. Crystals *A* to *F*, bordered by continuous lines, were in the top face, while crystals *G* to *M*, bordered by discontinuous lines, were in the lower face, their position being seen by looking from above.

Results obtained by Elam [1] showed that single crystals of aluminium, obtained by the strain-anneal method in aluminium rods, favoured a position with the ⟨110⟩ axis along the stress direction. Stone [2] has shown that it is possible to obtain a similar boundary effect in "Puron" iron, but not with "Armco" iron.

As no detailed experimental data were compiled during the growth of these crystals, it is not possible to state with any certainty the reason for this peculiar growth. It could be due, however, to a preferential growth of crystals inwards from the free surfaces of the bar or to the primary anneal being at too high a temperature, causing relatively large grains to be formed, the straining and subsequent anneal only enhancing growth in crystals least deformed by the strain. A further possibility is that the sectional shape of these test-pieces might be a contributing factor to this strange growth phenomenon.

The author wishes to express his sincere thanks to Dr. H. Wilman for many helpful suggestions and for discussion throughout the course of this work.

The author is also indebted to the Director of the Atomic Energy Research Establishment, Harwell, for financial support and for permission to publish this letter.

RAYMOND K. HART

Formerly of Applied Physical Chemistry Laboratories, Imperial College of Science and Technology, London, S.W.7.

Now at: Department of Metallurgy, University of Cambridge.

REFERENCES

1. C. F. Elam, *Phil. Mag.*, 1925, [vi], **50**, 518.
2. F. G. Stone, *Trans. Amer. Inst. Min. Met. Eng.*, 1948, **175**, 908.

PERSONALITIES

Dr. R. T. Parker

Robert Thomas Parker, who was recently elected Chairman of the Oxford Local Section of the Institute, was born in 1909 and educated at Woolwich Polytechnic School. From 1925 to 1930 he was an assistant in the laboratories of Fry's Metal Foundries, Ltd., at Blackfriars and Merton Abbey. He then spent three years at the Royal School of Mines, where he obtained the B.Sc. degree and A.R.S.M.

After one year spent in the reduction works of The British Aluminium Co., Ltd., he became an Investigator on the staff

Published 22 June

PROPERTIES OF METALLIC SURFACES

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8vo. Pp. 370, with 155 illustrations in the text. **Price £1.15.0 or $5.50, post free** (Each member of the Institute of Metals may buy one copy at **17s. 6d. or $3.00, post free**)

The volume contains 13 papers presented at a Symposium organized by the Metal Physics Committee of the Institute of Metals and held in London on 19 November, 1952.

The Symposium was designed to interest not only metallurgists but also engineers, physicists, and chemists, and a wide range of properties of metallic surfaces was covered, as may be seen from the list of titles given below. Some of the papers invited take the form of first-class reviews; others contain the results of important new researches. All are by authors outstanding in their respective fields.

The meeting attracted an attendance of nearly 500 people, a number of them from abroad. A valuable discussion took place and is reported *in extenso*, with illustrations, in the monograph. The whole book will prove invaluable to those whose work is concerned with any aspect of metal surfaces.

CONTENTS

Specialized Microscopical Techniques in Metallurgy. By Professor S. Tolansky. **Radioisotopes in the Study of Metal Surface Reactions in Solutions.** By Massoud T. Simnad. **The Influence of Machining and Grinding Methods on the Mechanical and Physical Condition of Metal Surfaces.** By Peter Spear, Ian R. Robinson, and K. J. B. Wolfe. **The Effect of Lubrication and Nature of Superficial Layer After Prolonged Periods of Running.** By F. T. Barwell. **The Crystalline Character of Abraded Surfaces.** By P. Gay and P. B. Hirsch. **The Effect of Surface Conditions on the Mechanical Properties of Metals, Mainly Single Crystals.** By Professor E. N. da C. Andrade. **The Effect of Surface Condition on the Strength of Brittle Materials.** By Professor C. Gurney. **The Influence of Surface Condition on the Fatigue Strength of Steel.** By R. J. Love. **The Influence of Surface Films on the Friction and Deformation of Surfaces.** By F. P. Bowden and D. Tabor. **Diffusion Coatings.** By D. M. Dovey, I. Jenkins, and K. C. Randall. **The Nature and Properties of the Anodic Film on Aluminium and Its Alloys.** By H. W. L. Phillips. **Chemical Behaviour as Influenced by Surface Condition.** By U. R. Evans. **The Effect of Method of Preparation on the High-Frequency Surface Resistance of Metals.** By R. G. Chambers and A. B. Pippard.

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of the British Non-Ferrous Metals Research Association, being concerned mainly with researches on melting and casting. In 1938 he joined the Northern Aluminium Co., Ltd., Banbury, as an Investigator, and remained there until

1946, when he was transferred to the staff of Aluminium Laboratories, Ltd. In 1950 he was appointed to his present post of Director of Research.

Dr. Parker—he obtained the Ph.D. degree of London University in 1941—is a Fellow of the Royal Institute of Chemistry and of the Institution of Metallurgists. He has been a member of the Institute since 1940, and was elected a Vice-Chairman of the Oxford Local Section on its formation two years ago.

PERSONAL NOTES

Lord Baillieu has been elected an Honorary Member of the Institution of Mining and Metallurgy in recognition of his services to the mining and metallurgical industries and of his work as Chairman of the Empire Council of Mining and Metallurgical Institutions.

Professor Paul Bastien has been elected a Vice-President of the Société des Ingénieurs Civils.

Dr. R. W. Cahn is to spend 1954 as Visiting Lecturer in Metallurgy in the Department of Mechanical Engineering at Johns Hopkins University, Baltimore, Md., U.S.A.

Professor Bruce Chalmers has been appointed Gordon McKay Professor of Metallurgy at Harvard University. He will continue as Editor of the new international publication *Acta Metallurgica*.

Professor C. W. Dannatt has been elected a Vice-President of the Institution of Metallurgists.

Mr. John R. Freeman, Jr., Technical Manager of The American Brass Company, has been appointed Vice-President of Metallurgy and Research to the Company. In his new capacity he will be responsible for all metallurgical research projects throughout the Company's various branches.

Dr. W. R. Hibbard, Jr., has been appointed Manager of the newly established Alloys Studies Section in the Metallurgy Department of the General Electric Research Laboratory, Schenectady, N.Y.

Dr. S. L. Hoyt, who has been a member of the Institute since 1913, retired on 1 June as Technical Advisor of Battelle Memorial Institute, after 14 years of service. He will remain as a part-time consultant and, except for 2 months each summer at Silver Lake, Calif., will be a metallurgical consultant for industry. His interests will include both Europe and the United States.

Mr. J. P. Hugo, having completed his studies at Sheffield University, has returned to South Africa, where he will be employed by the South African Iron and Steel Industrial Corporation.

Professor G. Letendre, an Honorary Corresponding Member to the Council for Canada, has been elected a Vice-President of the Canadian Institute of Mining and Metallurgy. Some months ago, Professor Letendre became senior partner in a new firm of consulting engineers—Letendre, Monti and Associates, with offices in Montreal and Quebec. He remains Director of the Department of Mining and Metallurgy at Université Laval in Quebec.

Mr. J. N. Moudgill has been appointed Vice-Principal of Delhi Polytechnic, Delhi, India.

Mr. W. S. Nelmes has been appointed Foundries Manager to Elkington, Ltd., Goscote Works, Bloxwich, near Walsall, Staffs.

Dr. L. Northcott has been elected a Vice-President of the Institution of Metallurgists.

Mr. Theodore E. Olt, Director of the Research Laboratories of the Armco Steel Corporation, Middletown, O., has been elected a member of the Board of Directors of the American Society for Testing Materials.

Dr. John M. Parks, formerly of the Armour Research Foundation of the Illinois Institute of Technology, has been appointed Manager of the Metallurgical Division of the Air Reduction Company, Inc., Murray Hill, N.J., U.S.A.

Mr. H. W. Paxton has left Birmingham University to become Assistant Professor of Metallurgy at the Carnegie Institute of Technology, Pittsburgh, Pa., U.S.A.

Dr. L. B. Pfeil has been elected President of the Institution of Metallurgists for the year 1953–54.

Mr. Philip Samuel has received the degree of Ph.D. in Metallurgy at Sheffield University, and is now employed in the Physics Section of the Research Laboratories of Hadfields, Ltd., Sheffield.

Mr. S. B. Smythe has left The Manganese Bronze and Brass Co., Ltd., Birkenhead, to take up an appointment with A. V. Roe and Co., Ltd., Middleton, Manchester.

Mr. J. Wilkinson, Director and General Manager of The Yorkshire Copper Works, Ltd., has been awarded an Honorary M.Sc. degree by Leeds University.

Coronation Honours

We offer our congratulations to the following members whose names appeared in the Coronation Honours List:

Mr. E. B. Babler, Chief of the Metallurgical and General Research Laboratories, Allen West and Co., Ltd., Brighton. (M.B.E.).

THE NON-DESTRUCTIVE TESTING OF METALS

By **R. F. HANSTOCK, Ph.D., F.Inst.P.**

(Institute of Metals Monograph and Report Series, No. 10)

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In this specially commissioned monograph, Dr. Hanstock, who is Chief Physicist to High-Duty Alloys, Ltd., has made a comprehensive survey of the various methods that are available for the non-destructive testing of metals, ranging from liquid-penetration methods of crack detection to the use of X-ray diffraction for the determination of grain-size and orientation and for the measurement of internal stresses. Special attention is devoted to damping-capacity measurements as a means of non-destructive testing, a field in which the author himself has worked extensively in recent years.

Throughout, emphasis is laid on the physical bases of the methods described, with specific examples of their application in many cases. The use of the book is facilitated by an Appendix in which are given in tabular form the properties that may be assessed by non-destructive means, the various methods applicable in each case, and brief comments on their suitability and limitations.

CONTENTS

Measurement of Thickness; Evaluation of Surface Finish; Detection of Cracks; Radiography; Ultrasonics; Dynamic Tests; Damping-Capacity Measurements; X-ray Diffraction, Electrical and Magnetic Methods; Methods of Analysis.

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Lubricants for the Cold Working of Non-Ferrous Metals, by S. F. Chisholm (Vacuum Oil Co., Ltd.).

The Cold Rolling of Non-Ferrous Metals in Sheet and Strip Form, by C. E. Davies (W. H. A. Robertson and Co., Ltd.).

Wire-Drawing Technique and Equipment, by F. T. Cleaver and H. J. Miller (British Insulated Callender's Cables Ltd.).

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Mr. D. A. Oliver, Metals Economy Adviser, Ministry of Supply. (C.B.E.)

Mr. S. W. Rawson, Director-General of Machine Tools, Ministry of Supply. (Knight.)

Sir Frederick Rebbeck, Chairman and Managing Director, Harland and Wolff, Ltd., Belfast. (K.B.E.)

Death

The Editor regrets to announce the death of:

Professor Daniel Hanson, D.Sc., at his home at Haselor, near Alcester, Warwickshire, on 12 June, aged 61. He had held the chair of Metallurgy at Birmingham University since 1926, and had served on the Council of the Institute as an Ordinary Member from 1925 to 1928 and from 1940 to 1944 and as a Vice-President from 1928 to 1939. The Institute was represented by Professor F. C. Thompson (President) at the funeral, which took place at Haselor on 16 June.

OBITUARY

Mr. W. Waterhouse Gibbins

William Waterhouse Gibbins, who died at his home in Gloucester on 5 May, aged 84, was an Original Member of the Institute of Metals. He was born in Birmingham in 1869, educated at King Edward's School, Birmingham, and at Scarborough and afterwards at King's College, Cambridge, where he gained the Natural Science Tripos and subsequently the M.A. degree. In 1890 he joined his family business, The Birmingham Battery and Metal Co., Ltd., being appointed a Director in 1903, and eventually becoming Chairman of the Company in 1923. In 1925 he ceased to take part in the active management of the business, but remained Chairman until the time of his death. He travelled abroad on many occasions on behalf of his firm.

Mr. Gibbins was well known and much respected in Birmingham business circles and took an active part in the affairs of the wrought non-ferrous metals industry. For eleven years he was Chairman of the Brass Wire Association and for nearly 30 years he represented the Brass and Copper Tube Association on the Grand Council of the Federation of British Industries.

Mr. Gibbins devoted much of his time to public service in industrial organizations. His associates there were deeply impressed with the earnestness and sincerity which he always displayed, and with the whole-hearted way in which he devoted himself to the problems with which he was confronted. He never sought the limelight, but was ever ready to give of his best.

In addition, Mr. Gibbins undertook a good deal of public work in connection with education in the Birmingham area. Thus, he was Chairman of the Committee of the Technical School (later Technical College), Selly Oak, and he was for a time a member of the Education Committee of the Worcestershire County Council. He served as Chairman of the Friends' Education Committee in Birmingham and, for many years, as Honorary Treasurer of the Workers' Educational Association in the Birmingham district, and as a member of the Advisory Committee of the Birmingham Technical College.

Mr. Gibbins was very interested in farming and a lover of country life, and after his partial retirement in 1925, he went to live in the country, where he owned a farm. He did a great deal to improve the land that was cultivated by his tenant.

He married in 1910 Marian, eldest daughter of the late John Bellows of Upton Knoll, near Gloucester, who survives him.

NEWS OF LOCAL SECTIONS AND ASSOCIATED SOCIETIES

Local Sections Committee

The Local Sections Committee held its annual meeting on 24 June at the offices of the Institute, under the chairmanship of Dr. L. B. Pfeil. Last session's activities were reviewed, and plans for the forthcoming session were discussed.

Birmingham Metallurgical Society

At the annual general meeting of the Society held on 29 May, the following officers were elected for the session 1953–54:

President: Mr. G. Parkin.

Vice-Presidents: Mr. H. Evans, Mr. J. O. Hitchcock, Dr. C. E. Homer, and Mr. H. H. Symonds.

Hon. Treasurer: Mr. A. C. Craig.

Mr. L. G. Beresford, Mr. H. M. Bigford, Mr. L. O. Cartwright, and Mr. E. S. Lloyd, were elected to fill vacancies on the Council.

APPOINTMENTS VACANT

ALUMINIUM COMPANY requires for London Sales Office a technical man with metallurgical and production experience in the aluminium industry. Box No. 771, 15 Hill Street, London, W.1.

INDUSTRIAL FURNACE MANUFACTURERS have a vacancy in their Research Dept. for a young metallurgist with honours degree or equivalent, for work in connection with design and application of heat-treatment and melting furnaces. Previous industrial experience not essential; initiative and ability to deal with a wide variety of problems more important than specialization in one subject. Starting salary according to age and experience; good opportunities of advancement for satisfactory candidate. Apply in writing to Chief Metallurgist, Birlec, Ltd., Tyburn Road, Erdington, Birmingham 24.

LIGHT-ALLOY FOUNDRY. Applications are invited for a senior executive appointment in an important light-alloy foundry. Applicants should be 35/45 years and at present in receipt of four-figure salary; must have wide experience in production of aluminium and magnesium castings by the most modern methods; proved administrative ability and preferably an engineering background. Box No. 351, The Institute of Metals, 4 Grosvenor Gardens, London, S.W.1.

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THE IRON AND STEEL INSTITUTE requires young metallurgist as assistant in information department. Academic training essential, works or research experience and knowledge foreign language(s) desirable. Write, stating age, qualifications, experience, salary desired, to the Secretary, 4 Grosvenor Gardens, London, S.W.1.

NOTICE TO AUTHORS OF PAPERS FOR THE "JOURNAL" AND CONTRIBUTORS TO DISCUSSIONS

1. **Papers will be considered for publication from non-members as well as members of the Institute.** They are accepted for publication in the *Journal* and not necessarily for presentation at any meeting of the Institute. MSS. should be addressed to The Editor of Publications, The Institute of Metals, 4 Grosvenor Gardens, London, S.W.1.

2. **Papers suitable for publication** may be classified as:

(*a*) Papers recording the results of original research.

(*b*) First-class reviews of, or accounts of progress in, a particular field.

(*c*) Papers descriptive of works methods, or recent developments in metallurgical plant and practice.

(*d*) Papers in classes (*a*), (*b*), and (*c*) above, previously published in languages other than English, French, German, or Italian, if of sufficient merit.

3. **Manuscripts and illustrations** should be submitted in duplicate. MSS. must be typewritten (*double-line spacing*) on one side of the paper only, and authors are requested to sign a declaration that neither the paper nor a substantial part thereof has been published elsewhere. Exceptions may be made in certain cases where a paper has been published in a language other than English, French, German, or Italian (see 2(*d*) above). MSS. not accepted are normally returned within 6 months of receipt.

In the interests of economy, all papers must be written as concisely as possible; in general, internal research reports are not in suitable form for publication as papers in the *Journal*. All but the simplest mathematical expressions should be written by hand, with capital and small letters clearly distinguished. Superscript and subscript letters should also be plainly indicated. Greek letters and special signs should be identified in the margin. For style, spelling, and abbreviations used, any recent issue of the *Journal* may be consulted.

4. **Synopsis.** Every paper must have a synopsis (not exceeding 250 words in length) which, in the case of a paper reporting original research, should state its objects, the ground covered, and the nature of the results. The synopsis will appear at the beginning of the paper, and should be in a form suitable for use by abstracting organizations. Extracts from a "Guide for the Preparation of Synopses" drawn up by the Abstracting Services Consultative Committee are reproduced below.

5. **References** must be collected at the end of the paper and must be numbered in the order in which they occur in the MS. Initials of authors must be given, and the Institute's official abbreviations for periodical titles (as used in *Metallurgical Abstracts*) should be employed, where known. References to papers should be set out in the style:

A. L. Dighton and H. A. Miley, *Trans. Electrochem. Soc.*, 1942, **81**, 321 (i.e. year, volume, page).

References to books should be in the following style:

C. Zener, "Elasticity and Anelasticity of Metals". Chicago: **1948** (University of Chicago Press).

6. **Illustrations.** Each illustration must have a number and description; only one set of numbers must be used in one paper, and it is desirable to number the half-tone illustrations consecutively, rather than to intersperse them with the line figures. The captions should be typed on a separate sheet.

The set of **line figures** sent for reproduction must be drawn (about twice the size to appear in the *Journal*) in Indian ink on smooth white Bristol board, good-quality drawing paper, co-ordinate paper, or tracing *cloth*, which are preferred in the order given. Co-ordinate paper, if used, must be blue-lined, with the co-ordinates to be reproduced finely drawn in Indian ink. Curves should be drawn boldly (i.e. at least twice the thickness of the frame). Experimental points should be indicated by open or closed circles, triangles, squares, &c. (preferably not crosses). Curves should be broken on each side of such symbols and plenty of allowance should be made for closing up in blockmaking. All lettering and numerals, &c., should preferably be in *pencil*, so that the Institute's standard lettering may be affixed, and ample margins must be left outside the framework of the figures to enable this to be done. The second set of line illustrations may be photostat copies.

Photographs must be restricted in number, owing to the expense of reproduction, and photomicrographs should be trimmed to the smallest possible of the following sizes consistent with adequate representation of the subject: 4 in. deep by 3 in. wide: 2 in. deep by 3 in. wide: 2 in. square. Magnifications of photomicrographs must be given in each case. Photographs for reproduction should be loose, not pasted down (and not fastened together with a clip, which damages them), and the figure number and author's name should be written on the back of each. Captions should be given to the photomicrographs, but these should be kept as brief as possible.

Because of the present high cost of printing and paper it is imperative that authors restrict illustrations (particularly photographs) to the absolute minimum deemed necessary to support their argument. Only in exceptional cases will illustrations be reproduced if already printed and readily available elsewhere.

7. **Tables or Diagrams.** Results of experiments, &c., may be given in the form of tables *or* figures, *but* (unless there are exceptional reasons) *not both*. Tables should bear Roman numbers, and each should have a heading that will make the data intelligible without reference to the text.

8. **Corrections.** A certain number of corrections in proof are inevitable, but any modification of the original text is to be avoided. Since corrections are very expensive, the Institute reserves the right to require authors to contribute towards their cost if the Editor deems them to be excessive. The Institute also reserves the right to require a contribution to the cost of remaking any block where this is necessitated by an error on the author's part.

9. **Reprints.** Individual authors are presented with a maximum of 25, and two or more authors with a maximum of 50 reprints from the *Journal*, without covers. Limited numbers of additional reprints can be supplied at the author's expense, if ordered before proofs are passed for press. (Orders should preferably be placed when submitting MSS.)

10. **Discussion.** Except in the case of special symposia, shorthand records of discussions are not taken at meetings. Written discussion may be submitted on any paper, preferably typewritten (*double-line spacing*). References should be given in the form of footnotes. Paragraphs 6 and 7 above are also applicable to such contributions. Reprints of discussion cannot be supplied to contributors.

GUIDE FOR THE PREPARATION OF SYNOPSES

(*As recommended by the Abstracting Services Consultative Committee*)

1. **Purpose.** The synopsis is not part of the paper; it is intended to convey briefly the content of the paper, to draw attention to all new information, and to the main conclusions. It should be factual.

2. **Style of writing.** The synopsis should be written concisely and in normal rather than abbreviated English. It is preferable to use the third person. Where possible use standard rather than proprietary terms, and avoid unnecessary contracting.

It should be presumed that the reader has some knowledge of the subject, but has not read the paper. The synopsis should therefore be intelligible in itself without reference to the paper; for example, it should not cite sections or illustrations by their numerical references in the text.

3. **Content.** The title of the paper is usually read as part of the synopsis. The opening sentence should be framed accordingly and repetition of the title avoided. If the title is insufficiently comprehensive, the opening should indicate the subjects covered. Usually the beginning of a synopsis should state the objective of the investigation.

It is sometimes valuable to indicate the treatment of the subject by such words as: brief, exhaustive, theoretical, &c.

The synopsis should indicate newly observed facts, conclusions of an experiment or argument and, if possible, the essential parts of any new theory, treatment, apparatus, technique, &c.

It should contain the names of any new compound, mineral species, &c., and any new numerical data, such as physical constants; if this is not possible, it should draw attention to them. It is important to refer to new items and observations, even though some are incidental to the main purpose of the paper; such information may otherwise be hidden, though it is often very useful.

When giving experimental results the synopsis should indicate the methods used; for new methods the basic principle, range of operation, and degree of accuracy should be given.

4. **References.** If it is necessary to refer to earlier work in the summary, the reference should always be given in full and not by number. Otherwise references should be left out.

When a synopsis is completed, the author is urged to revise it carefully, removing redundant words, clarifying obscurities, and rectifying errors in copying from the paper. Particular attention should be paid by him to scientific and proper names, numerical data, and chemical and mathematical formulæ.

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